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Agricultural Memorandum No 791

Glasshouse Watering Requirements at Cranleigh, Surrey

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In April 1975 a sunshine recorder was installed at the West Cranleigh Nurseries of N Vrijland, Cranleigh, Surrey. The purpose was threefold:-

i) To examine the local belief that Cranleigh was especially favoured as regards sunshine.

ii) To check ADAS estimates of water requirements interpolated from data from the south coast and Lea Valley areas.

iii) To compare these estimates with readings from 4 Jones/Rothwell evaporimeters exposed in the Cranleigh glasshouses.

1. Sunshine measured at Cranleigh

The average of mean daily sunshine for 4 climat stations - Wisley, Merrist Wood, Alice Holt Lodge and Fernhurst - was assumed to be representative of the area as a whole and weekly values of mean daily sunshine for these 4 stations and Cranleigh are shown in Table 1. Although there appears to be some slight justification for the claim that Cranleigh gets more sunshine than the surrounding area only about 1 in 3 of these weekly differences is statistically significant - and half of these show Cranleigh to have had less sunshine than the other 4 stations - and it is probable that the variation among the 5 sets of data is due mainly to the normal differences in evaluating the sunshine records by individual observers. Over the comparison period, the mean daily sunshine for Cranleigh (7.33 hours, SD = 2.826) does not differ significantly from the average for the other 4 stations (7.19 hours, SD = 2.889).

2. Water Requirements

Forsdyke[1] has shown that estimates of potential transpiration made by the method of MAFF Tech. Bull. No 16, provide an acceptable approximation to glasshouse water requirements. Weekly estimates of water requirement for Cranleigh were made by two methods:-

a) By applying Cranleigh sunshine values to smoothed weekly averages of PT, sunshine and weighting factor derived from the monthly values for area 32[2].

b) By multiplying the Met O 8a monthly estimates of potential transpiration for area 32 by the ratio of weekly to monthly sunshine totals at Cranleigh

These two estimates were converted to water requirements using the relationship 1 inch PT = 22622 gallons per acre and were compared with the ADAS estimates in Table 2. On the basis of the measured sunshine, the ADAS advice appears to

over estimate the water requirement by an appreciable amount and over this period would have resulted in a seasonal excess of some 40,000 gallons per acre being applied. The water wastage is considerable but even that factor is probably of secondary importance to the leaching of nutrients in a free draining soil and the possible consequent pollution of drainage water.

3. Evaporimeter estimates

Weekly evaporimeter totals and corresponding estimates of water requirements, (recommended conversion factor is 1.00 ML = 1780 gallons per acre) are shown in Table 3 for the same weekly periods as used in Tables 1 and 2.

These evaporimeter figures - presumably a reasonable sample of the data which may be obtained from normal commercial use of this type of instrument - must be regarded with some suspicion.

i) The variability between the 4 sites is very large - the ratio of highest to lowest readings is between 1.5 and 2 to 1 in most weeks.

ii) Despite the recommendation that the instrument should be topped up before the readings exceeds 4.0 ML, a high percentage of individual daily readings exceed 4 ML - many exceeding 5 ML with one reading, on June 13, of 9.9 ML. On the basis of the recommended conversion factor, 1 ML per day represents a potential transpiration of approximately 0.08 inches per day, 5 ML approximately 0.40 inches per day and 9.9 ML nearly 0.8 inches per day.

iii) The seasonal water requirement (for a one week shorter period) varies from about 440 to 710 thousand gallons per acre - even the smaller of these two figures represents an excess application of over 100,000 gallons per acre over about 4 months.

Conclusions

1. There is no strong evidence in favour of the claim that Cranleigh gets more sunshine than the surrounding area.

2. Sunshine measurements on site, or from nearby recording stations, should be used to estimate water requirements rather than interpolation between the south coast and Lea Valley figures.

3. Unless great care is taken in siting, maintaining and reading evaporimeters of the Jones/Rothwell type, serious errors in estimating water requirements are likely to occur. It may be necessary to read and top-up the instrument more than once a day in prolonged sunshine and there is a suspicion that each instrument may require individual calibration.

References

1. **Forsdyke**, D., A Comparison of Glasshouse Crop Water Requirements derived from Sunshine and Solarimeter Records at Efford EHS, ADAS Q. Rev. (1974)12, 139-144.

2. Smith, L.P., Agro-climatic area averages - summer potential transpiration, Agr.Memo. No 693, January 1975.

Any comments or suggestions on this paper should be referred to the author.

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Table 1

Mean daily sunshine

Week ending	Wisley	Merrist Wood	Alice Holt	Fernhurst	Mean of 4	Cranleigh
8.5.75	6.03	5.20	6.29	6.06	5.89	6.11
15	2.54	(2.69)*	2.63	2.91	2.69	2.74
22	5.47	5.13	5.33	5.56	5.37	5.76
29	5.50	4.64	5.56	6.06	5.44	6.90
5.6.75	6.99	6.51	7.23	6.77	6.87	7.27
12	13.56	13.50	13.80	13.09	13.49	13.69
19	7.67	7.93	9.49	7.96	8.26	6.40
26	11.36	11.61	11.17	10.07	11.05	9.81
3.7.75	8.57	7.76	7.97	8.36	8.17	8.37
10	6.63	6.24	7.14	6.79	6.70	6.89
17	5.84	5.04	5.67	5.71	5.57	6.16
24	6.03	5.14	5.13	4.99	5.32	5.53
31	9.66	9.44	9.16	9.64	9.47	8.97
7.8.75	10.99	10.74	11.07	10.97	10.94	11.39
14	8.01	6.90	7.61	7.56	7.52	7.96
21	2.84	2.81	3.41	3.56	3.15	3.21
28	9.74	9.24	9.26	9.60	9.46	10.59
4.9.75	3.90	3.91	4.50	4.10	4.10	4.16
Mean	7.30	6.91	7.36	7.21	7.19	7.33
SD	2.967	3.028	2.912	2.711	2.889	2.826

*Incomplete data - average of 3 used.

Table 2

Estimated Water Requirements

Week ending	Estimated Potential Transpiration (Inches)		Water Requirement (Thousand gallons/acre)		
	a	b	a	b	ADAS
8.5.75	0.70	0.63	15.8	14.3	18.3
15	0.31	0.46	7.0	10.4	15.2
22	0.66	0.66	14.9	14.9	22.7
29	0.79	0.76	17.9	17.2	20.7
5.6.75	0.88	0.80	19.9	18.1	22.1
12	1.66	1.29	37.5	29.2	30.3
19	0.78	0.83	17.7	18.8	26.7
26	1.19	1.12	26.9	25.3	28.2
3.7.75	1.07	1.05	24.2	23.7	27.1
10	0.88	0.94	19.9	21.3	23.8
17	0.79	0.87	17.9	19.7	22.3
24	0.71	0.82	16.1	18.5	19.5
31	1.14	1.05	25.8	23.7	24.6
7.8.75	1.19	1.19	26.9	26.9	19.9
14	0.83	0.92	18.8	20.8	22.8
21	0.33	0.56	7.5	12.7	13.1
28	1.10	1.02			
Total			313.9	315.5	357.3

Table 3

Evaporimeter data

Week Ending	Evaporimeter Totals (ML)				Water Requirement (Thousand gallons/acre)			
	A_1	A_2	B	C	A_1	A_2	B	C
8.5.75	12.2	12.2	14.1	13.5	21.7	21.7	25.1	24.0
15	8.1	6.0	10.3	9.4	14.4	10.7	18.3	16.7
22	16.7	12.5	18.6	20.2	29.7	22.3	33.1	36.0
29	23.3	12.7	21.0	24.1	41.5	22.6	37.4	42.9
5.6.75	27.5	16.4	25.8	31.4	48.9	29.2	45.9	55.9
12	37.0	25.9	35.2	40.5	65.9	46.1	62.7	72.1
19	28.1	22.7	32.9	29.1	50.0	40.4	58.6	51.8
26	28.4	22.0	30.4	30.9	50.5	39.2	54.1	54.8
3.7.75	27.9	20.2	27.0	30.4	49.7	36.0	48.1	54.1
10	21.5	17.6	23.3	27.5	38.3	31.3	41.5	48.9
17	18.4	13.8	17.9	22.6	32.7	24.6	31.9	40.2
24	16.7	12.0	14.1	21.0	29.7	21.4	25.1	37.4
31	25.6	19.2	25.7	33.2	45.6	34.2	45.7	59.1
7.8.75	19.3	16.4	18.7	29.9	34.3	29.2	33.3	53.2
14	21.6	16.8	20.3	34.5	38.4	29.9	36.1	61.4
Totals					591.3	438.8	596.9	708.5

Note A_1 and A_2 are both in the same 7 acre glasshouse.